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ABSTRACT

A study was undertaken to investigate which of ten constructions are available to children of various ages for expressing conditionality. A modified sentence completion test based on use of the ten constructions was designed, field-tested, and administered individually to 20 students in each of five grades: kindergarten and grades two, four, six, and eight. Analysis of the data indicated that increasing numbers of constructions were available to subjects as they matured and that there was an observable developmental order among the ten constructions. Among the conclusions reached were that children as young as five years old have the ability to use a variety of linguistic means for expressing conditionality and that constructions involving "unless" were significantly more difficult than other constructions. (The paper includes numerous tables of data, a discussion of considerations in selecting a data collection method for the study, and a copy of the sentence completion test that was used.) (GT)

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CHILDREN'S ACQUISITION OF LINGUISTIC MEANS FOR EXPRESSING CONDITIONALITY

A number of studies on children's acquisition of connectives, including research on children's comprehension and production of conditional utterances, have been based on the assumptions that 1) connectives in natural language correspond to the formal logic categories of conjunction, disjunction, implication, and equivalence, and 2) the propositional calculus of formal logic is operative for connectives in natural language. Studies on connectives by Neimark and Slotnick (1970), Bourne and O'Banion (1971), Suppes and Feldman (1971), and Paris (1973) make these assumptions either implicitly or explicitly, as do studies on conditionality by Hill (1960), Peel (1967), Shapiro and O'Brien (1970), and Knifong (1974).

There is linguistic evidence, however, that the logic underlying natural language is not that of formal logic (G. Lakoff, 1970; R. Lakoff, 1971; DeStefano, 1973; Olson, 1977). The natural language use of connectives provides a number of examples. For instance, it can be shown that linguistic expressions of conditionality cannot adequately be treated in terms of formal logic. The propositional calculus of formal logic assumes a one-to-one correspondence between the conditional relationship and the linguistic marker if/then. However, in natural language such a one-to-one relationship does not exist. Rather, the following relationships are present in natural language:

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1. The connective if/then in natural language signals either conditionality or bi-conditionality.[1] This is unlike its use in formal logic, where it signals only implication.

2. The conditional relationship in natural language is conveyed in a number of ways, unlike in formal logic where it is conveyed only through the use of if/then.

The tendency of adults to interpret some natural language uses of if/then as if and only if/then has been discussed by Geis and Zwicky (1971) and by Fillenbaum (1975). Other data reported by Fillenbaum (1976) indicate that adults use a variety of terms to express conditionality in natural language, including if/then, and, or, when, unless, and others. These data support the position that, for adults, the logic underlying natural language uses of conditionality is not that of formal logic.

Review of Related Literature

Children's speech increases in complexity throughout their elementary school years, with continuing use of conjoined constructions and increasing use of embedded constructions (O'Donnell, Griffin, and Norris, 1967). Review of the research on children's use of connectives to produce conjoined and embedded constructions suggests a developmental pattern operative in the acquisition of connectives.

Werner and Kaplan (1967) described a developmental pattern in German children's acquisition of connectives which proceeds from paratactic (or lexically unmarked) expressions of conjunction to hypotactic (or explicit) signaling of relationships between thoughts, with connectives that combine events used before connectives that express dependent relationships. Longitudinal and cross-sectional data from English-speaking children reported by Jacobsen

(1974) supported the developmental sequence proposed by Werner and Kaplan, with simple coordination and sequence appearing early (at first lexially unmarked and then signaled by too, and, then). Antithesis (lexically unmarked or signaled with an already-acquired connective like and) appeared next. Dependency relationships were last to appear. Hypotactic marking of dependency relationships began with the appearance of causal connectives including because, when (indicating a condition necessary for an event to occur), and so (meaning both "that's why" and "in order that"). Or, if, before, after, and while were later-appearing connectives.

Sentence repetition data reported by Menyuk (1969) and by Slobin and Welsh (1974) also indicate that young children use conjoining before they use embedding. Menyuk (1971) reported that early sentence-combining efforts of young children were characterized by sentences which are topically related but which syntactically are simply sequenced (for example, "He hurt me. I hurt him back."). The first lexically-marked conjoined sentences were observed in the speech of children between the ages of two and three (for example, "Dis one little, annat one big.") All the children studied by Menyuk were using and in spontaneous speech by the age of four, but the use of connectives like because, if, and so was still being acquired by children betwen the ages of four and six.

Johansen and Sjolen (1975) examined uses of and and or in the spontaneous speech of Swedish children ages 2;0 to 7;6. The younger children used and only to express enumeration, while the older children also used it to express temporality. None of the children used and in a causal sense. Or was used only in its exclusive sense (that is, to link mutually exclusive alternatives) and not for inclusive disjunction.

Olds (1968), Clark (1971), and Hatch (1971) studied children's interpretation of various temporal constructions (and then, but first, before, after, as soon as, when, etc.) Hatch found that and first and but then were understood prior to before and after. Clark found that before was understood by more younger children than was after. In contrast to Clark's findings, Olds reported that before was more difficult for young children to interpret than were after, as soon as, and when. In other studies, Katz and Brent (1968), Hatch (1969), and Clark (1974) found that children first process temporal constructions according to an order-of-mention strategy before full use of connective terms in acquired.

Katz and Brent also studied first and sixth graders' understanding of causal and adversative relationships. They reported that first graders demonstrated an understanding of causal relationships, but some omitted causal connectives in their spontaneous speech. Adversative connectives were more difficult than causal connectives for both first and sixth graders studied by Katz and Brent. More sixth graders than first graders used but in spontaneous speech, and none in either group used although. Olds used a game format to study children's interpretation of eleven complex connectives, including affirmative conditionals (if, should, and implied if), negative conditionals (if + not, unless), temporal contingencies (before, after, as soon as, when), and adversatives (but, although). He reported that children ages seven, nine, and eleven interpreted affirmative conditionals easily, but had more difficulty with the other types of connectives studied. Unless appeared to be the single most difficult connective for seven-year-olds and nine-year-olds, who interpreted it as if. Among the eleven-year-olds, the error rate for unless was about equal to that for if + not, indicating some improvement with age in the interpretation of unless. It remained, however, among the more difficult

connectives for the eleven-year-olds.

Piaget (1928) noted that French children as young as six used because appropriately in spontaneous speech, although they were more likely to use it to establish a cause-effect relationship between an action and its motivation than to establish logical justification. Then (in its logical sense) was used by children as young as 4;6, but therefore was not used appropriately by children as old as nine. Piaget theorized that therefore would not be used appropriately until the children developed the ability to see the need for, and to verbalize, logical justification.

Based on the data reported above, it appears that these principles operate in children's acquisition of connectives:

1. Conjoined syntatic structures appear before embedded structures.

2. Semantic relationships of simple conjunction (such as co-occurrence or sequence) appear before relationships of dependency (such as causality or conditionality).

3. New forms are first used for old functions; that is, when new connective terms first appear in children's speech, they often are used inappropriately before full adult-like usage is acquired.

4. New functions are first expressed by old forms; that is, newly acquired logical relationships are first expressed linguistically by unmarked means or are marked with previously acquired terms.

These principles also appear to be operative in the acquisition of connective constructions for expressing conditionality. The cognitive notion of conditionality has been observed in the speech of very young children, although it is at first unmarked lexically or marked with previously acquired connectives like and. Werner and Kaplan (1967) reported instances of unmarked conditional utterances in the speech of children as young as two years of age.

Jacobsen (1974) reported utterances produced by children before they have acquired the use of if which involve, if not conditionality in the full sense, at least a statement establishing one event as a precondition for another. (For instance, Adam at 3;2 said, "When its got a flat tire, its needa go to the station"; another child at 2;8, observed by Slobin and Ervin-Tripp, said, "When I get hurts, I put dose one of dose bandages on.").

The use of if is apparently acquired by most children between the ages of three and seven. It has been reported in the speech of children as young as 2;10 and 3;5 (Jacobsen, 1974). Menyuk (1971) reported that only 25% of the children she studied at age 3;5 used if in spontaneous speech, but that 60% of those studied at 6;8 used it.

Olds (1964) found that the majority of seven-year-olds studied were able to correctly interpret if constructions, but not if + not constructions. He found that unless was difficult for seven-year-olds and nine-year-olds, who interpreted unless as if. Both if + not and unless caused difficulty for some eleven-year-olds studied by Olds.

Purposes of the Study

The present study was undertaken to investigate which constructions for conditionality children produce at various ages. The particular constructions investigated were among those identified by Fillenbaum (1976) as commonly used by adults to express conditionality. The ten constructions were:

1. If A, then B. (e.g., If Bob wins, he'll get the trophy.)
2. B, if A. (e.g., Bob will get the trophy if he wins.)
3. When A, B. (e.g., When you finish the job, you'll be paid.)
4. B, when A. (e.g., You'll be paid when you finish the job.)
5. A and B. (e.g., Open an account today and choose a free gift.)
6. A or B. (e.g., Be careful or you'll get hurt.)
7. If not A, B. (e.g., If you don't hurry, you'll be late.)
8. B, if not A. (e.g., You'll be late if you don't hurry.)
9. Unless A, B. (e.g., Unless it rains, we'll have a picnic.)
10. B, unless A. (e.g., We'll have a picnic unless it rains.)

Specific questions examined were:

1. Is there an increasing number of linguistic constructions for expressing conditionality available to children as they mature?

2. Is there an observable order in which linguistic constructions for expressing conditionality are acquired by children?

Procedures

Instrument Development

A modified Sentence Completion Test (SCT) was designed to determine which of the ten constructions identified for study were available to subjects for expressing conditionality.[2] The SCT was composed of incomplete conjoined utterances which subjects were asked to complete; that is, subjects were given a stem consisting of the first proposition of a conditional utterance, along with the connective, and they were asked to complete the utterance. The SCT was a modification of the traditional sentence completion task in that a brief context was provided for each stem. Because four of the constructions included on the test (A and B; A or B; A, when B; B, when A) can be used to express logical relationships other than conditionality, it was not possible to convey the semantic intent of conditionality in item stems alone.

The thirty-item SCT was submitted to a panel of judges composed of selected psycholinguists.[3] Based on judges' responses, it was decided to field-test the SCT and to collect comparative data on subjects' use of the ten constructions in a less-contrived speech situation.

The SCT was field-tested on a sample of 100 subjects (twenty each at ages five, seven, nine, eleven, and thirteen), randomly selected from students of those ages at a laboratory school in which the student population is a stratified random sample representative of students in that state. Subjects were given the SCT in individual oral interviews of approximately fifteen minutes in length.

Responses were taped, transcribed, and coded as appropriate or inappropriate completions. To be judged as appropriate, subjects' responses to SCT items had to meet the following conditons:

1. The sentence completion is a clause, rather than a word or phrase.

2. The sentence completion produces a conjoined or embedded utterance that is conditional in nature: that is, one whose propositions exist in an antecedent/consequent relationship with the occurrence of the antecedent unknown, uncertain, or contrary-to-fact.

3. The sentence completion produces a conjoined or embedded utterance that is syntatically appropriate to the extent that it does not violate pronoun, verb tense, or connective restrictions in the following ways:

a) non-obervance of pronoun restrictions: "I'll give you half of this candy bar if I want it."

b) non-observance of verb tense restrictions: "I'll give you half of this candy bar if you wanted it."

c) non-observance of connective restrictions: "I'll give you half of this candy bar unless you want it."

Item analysis was done to determine if any items were significantly more difficult for subjects to complete appropriately than others within the same cluster of three items testing each construction. In Table 1, the frequency of appropriate response to each item within each age group and across all age groups is presented. The chi square one-sample test applied to each cluster of three items revealed no significant differences in the frequency of appropriate responses to any cluster of three items within any age group or across all age groups.[4]

In addition to the item analyses, frequency data for subjects' responses were tabulated to determine if there were any constructions so difficult that no subjects achieved three of three appropriate completions for items involving

TABLE 1

NUMBER OF SUBJECTS WITHIN AND ACROSS ALL AGE GROUPS WHO APPROPRIATELY COMPLETED EACH ITEM OF THE REVISED SENTENCE COMPLETION TEST

	Construction	Items	5 Year Olds	7 Year Olds	9 Year Olds	11 Year Olds	13 Year Olds	Totals for 100 Ss
I.	If A, B Example: If Bob wins, he'll get the trophy.	# 1 # 4 #28	19 20 19	19 20 20	20 20 19	20 20 20	20 20 20	98 100 98
II.	B, if A Example: Bob will get the trophy if he wins.	# 5 # 7 #25	15 18 20	20 20 19	19 20 20	20 20 20	20 20 20	94 98 99
III.	When A, B Example: When you finish the job, you'll be paid.	#11 #13 #21	19 17 19	19 20 19	20 20 20	20 20 20	20 20 20	98 97 98
IV.	B, when A Example: You'll be paid when you finish the job.	# 2 #17 #19	11 16 15	17 20 18	20 20 20	20 20 20	20 20 20	88 96 93
V.	A and B Example: Open an account today and choose a free gift	# 6 #14 #29	17 9 16	18 19 20	18 20 20	18 20 20	20 20 20	91 88 96

TABLE 1 - continued

	Construction	Items	5 Year Olds	7 Year Olds	9 Year Olds	11 Year Olds	13 Year Olds	Totals for 100 Ss
VI.	A or B	# 3	11	13	20	20	19	83
	Example: Be careful or you'll get hurt.	#16	14	19	20	20	20	93
		#27	17	19	20	19	20	95
VII.	If not A, B	#12	20	20	20	20	20	100
	Example: If you don't hurry, you'll be late.	#20	16	18	20	20	19	93
		#26	16	19	20	20	20	95
VIII.	B, if not A	# 9	17	10	20	19	20	86
	Example: You'll be late if you don't hurry.	#15	16	13	20	20	20	89
		#23	18	11	19	20	20	88
IX.	Unless A, B	#10	3	10	8	12	16	49
	Example: Unless it rains, we'll have a picnic.	#18	2	13	16	19	20	70
		#22	5	11	15	19	20	70
X.	B, unless A	# 8	0	5	13	17	18	53
	Example: We'll have a picnic unless it rains.	#24	6	5	15	19	18	63
		#30	10	11	18	19	20	78

that construction. In Table 2, tabulations of frequency data indicate that for all constructions at least some subjects achieved three of three appropriate completions.

In addition to field-testing the SCT, comparative data were collected on subjects' use of the ten constructions in a less-contrived speech situation. Because no established procedures or instruments for assessing children's use of the ten constructions under study could be found, it was not possible to establish a measure of concurrent validity for the SCT by comparing it to an already-validated test. Nor was it possible to collect comparative data on subjects' use of the ten constructions in spontaneous speech. (See Appendix A.) An interview technique involving paraphrase tasks was employed to elicit subjects' production of the ten constructions being studied. Following several synonym-production and simple paraphrase tasks designed to develop a mind-set for producing alternative linguistic forms for a given content, subjects were shown a complex picture which suggests a number of possible impending events.[5] As aspects of this picture were discussed, subjects were orally presented with four pairs of sentences relating to the picture and asked to combine sentence pairs in as many ways as possible, using the words if, when, and, or, and unless displayed on word cards before them. Positive reinforcement (in the form of praise and tokens) was used to elicit as many paraphrases as possible. Subjects' responses to the paraphrase tasks were taped, transcribed, and judged as appropriate or inappropriate uses of the constructions, based on the well-formedness of the utterances produced.

Comparisons were made between the SCT data and the paraphrase data to determine whether there was evidence of a relationship between subjects' ability to pass the criterion for a construction on the SCT (that is, to complete appropriately at least two of three items involving that construction) and their production of that construction in the paraphrase task. The number of subjects

TABLE 2

NUMBER OF SUBJECTS WITHIN AND ACROSS ALL AGE GROUPS WHO ACHIEVED 3 OF 3, 2 OF 3, 1 OF 3, AND 0 OF 3 APPROPRIATE SENTENCE COMPLETIONS FOR EACH CONSTRUCTION

Construction	Pass/Fail Criteria*	5 Year Olds	7 Year Olds	9 Year Olds	11 Year Olds	13 Year Olds	Totals for 100 Ss
I. If A, B Example: If Bob wins, he'll get the trophy.	3 of 3 Pass	18	20	19	20	20	97
	2 of 3 Pass	2	0	1	0	0	3
	1 of 3 Fail	0	0	0	0	0	0
	0 of 3 Fail	0	0	0	0	0	0
II. B, if A Example: Bob will get the trophy if he wins.	3 of 3 Pass	15	20	19	20	20	94
	2 of 3 Pass	3	0	1	0	0	4
	1 of 3 Fail	2	0	0	0	0	2
	0 of 3 Fail	0	0	0	0	0	0
III. When A, B Example: When you finish the job, you'll be paid.	3 of 3 Pass	16	18	20	20	20	94
	2 of 3 Pass	3	2	0	0	0	5
	1 of 3 Fail	0	0	0	0	0	0
	0 of 3 Fail	1	0	0	0	0	1

TABLE 2 - continued

Construction	Pass/Fail Criteria*	5 Year Olds	7 Year Olds	9 Year Olds	11 Year Olds	13 Year Olds	Totals for 100 Ss
IV. B, when A Example: You'll be paid when you finish the job.	3 of 3 Pass	8	17	20	20	20	85
	2 of 3	5	1	0	0	0	6
	1 of 3	5	2	0	0	0	7
	0 of 3 Fail	2	0	0	0	0	2
V. A and B Example: Open an account today and choose a free gift.	3 of 3 Pass	8	17	18	19	20	82
	2 of 3	7	3	2	1	0	13
	1 of 3	4	0	0	0	0	4
	0 of 3 Fail	1	0	0	0	0	1
VI. A or B Example: Be careful or you'll get hurt.	3 of 3 Pass	8	12	20	19	19	78
	2 of 3	6	7	0	1	1	15
	1 of 3	6	1	0	0	0	7
	0 of 3 Fail	0	0	0	0	0	0
VII. If not A, B Example: If you don't hurry, you'll be late.	3 of 3 Pass	15	17	20	20	19	91
	2 of 3	4	3	0	0	1	8
	1 of 3	1	0	0	0	0	1
	0 of 3 Fail	0	0	0	0	0	0

TABLE 2 - continued

	Construction	Pass/Fail Criteria*	5 Year Olds	7 Year Olds	9 Year Olds	11 Year Olds	13 Year Olds	Totals for 100 Ss
VIII.	B, if not A Example: You'll be late if you don't hurry.	3 of 3 Pass	13	16	19	19	20	87
		2 of 3	5	4	1	1	0	11
		1 of 3 Fail	2	0	0	0	0	2
		0 of 3	0	0	0	0	0	0
IX.	Unless A, B Example: Unless it rains, we'll have a picnic.	3 of 3 Pass	0	5	10	10	18	43
		2 of 3	4	7	5	10	2	28
		1 of 3 Fail	2	5	2	0	0	9
		0 of 3	14	3	3	0	0	20
X.	B, unless A Example: We'll have a picnic unless it rains.	3 of 3 Pass	0	3	15	19	18	55
		2 of 3	4	3	2	0	0	9
		1 Of 3 Fail	7	6	2	1	2	18
		0 of 3	9	8	1	0	0	18

*Appropriate completion of two or three of the three items for a construction constituted "passing" performance for the subject on that construction; appropriate completion of fewer than two of the three items for a construction constituted "failing" performance.

who either passed both measures or failed both measures (indicating the presence of a relationship between the two measures) was compared with the number of subjects who failed one but passed the other measure (indicating the absence of a relationship between the two measures). These comparisons, reported in Table 3, indicated evidence of a relationship between the measures, at least for Constructions I, III, V, VI, VII, and IX.[6]

The comparative data and field test findings were submitted to the panel of judges. Based on their responses, it was decided to require repetition as well as completion of sentence stems. Requiring repetition of stems in addition to production of sentence completions did not insure that subjects who demonstrated control of constructions on the SCT could also produce those constructions for conditionality in spontaneous speech, but there is evidence that the ability to repeat a construction corrolates with the use of that construction in spontaneous speech (Slobin and Welsh, 1974). Thus, it was felt that requiring repetition of stems increased the validity of the SCT as a measure of subjects' ability to use the constructions being studied.

Collection of the Data

The Sentence Completion Test[7] was administered to 100 subjects ages five through thirteen. Twenty subjects at each grade level were randomly selected from the population of students in kindergarten and grades two, four, six, and eight in a laboratory school where the student population is a stratified random sample representative of the student population in that state. No students were included who had been included in the field-test sample. In addition, only students judged by their teachers and by the investigator as being speakers of general American English were included in the sample, in order to avoid the intrusion of dialect differences and English as a second language as factors in test results.

Subjects were given the SCT in individually-administered oral interviews

TABLE 3

NUMBER OF SUBJECTS EITHER PASSING OR FAILING BOTH SCT AND PARAPHRASE TASKS COMPARED WITH NUMBER OF SUBJECTS PASSING ONE AND FAILING ONE OF THE TASKS

Construction	Five Year Olds		Seven Year Olds		Nine Year Olds		Eleven Year Olds		Thirteen Year Olds		Total Group		
	Category 1*	Category 2**	Category 1	Category 2	Category 1	Category 2	Category 1	Catetory 2	Category 1	Category 2	Category 1	Category 2	% Ss in Category A
I. If A, B Example: If Bob wins, he'll get the trophy.	8	1	12	1	12	0	18	0	16	0	64	4	97%
II. B, if A Example: Bob will get the trophy if he wins.	1	18	9	9	8	10	4	16	7	13	29	66	30%
III. When A, B Example: When you finish the job, you'll be paid.	13	5	14	2	11	1	19	0	19	0	76	8	90%

TABLE 3 - continued

Construction	Five Year Olds		Seven Year Olds		Nine Year Olds		Eleven Year Olds		Thirteen Year Olds		Total Group		
	Category 1*	Category 2**	Category 1	Category 2	Category 1	Category 2	Category 1	Catetory 2	Category 1	Category 2	Category 1	Category 2	% Ss in Category A
IV. B, when A Example: You'll be paid when you finish the job.	8	12	3	14	4	15	1	19	6	13	22	73	23%
V. A and B Example: Open an account today and choose a free gift.	8	9	9	4	13	2	14	0	15	1	59	16	78%
VI. A or B Example: Be careful or you'll get hurt.	9	10	7	3	9	1	11	2	12	1	48	17	73%
VII. If not A, B Example: If you don't hurry, you'll be late.	11	5	14	5	13	4	14	1	19	1	71	16	82%

TABLE 3 - continued

Construction	Five Year Olds		Seven Year Olds		Nine Year Olds		Eleven Year Olds		Thirteen Year Olds		Total Group		
	Category 1*	Category 2**	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	% Ss in Category A
VIII. B, if not A Example: You'll be late if you don't hurry.	2	18	1	18	4	16	2	18	3	17	12	87	12%
IX. Unless A, B Example: Unless it rains, we'll have a picnic.	12	3	5	4	5	4	9	0	12	1	43	12	78%
X. B, unless A Example: We'll have a picnic unless it rains.	15	5	13	4	8	10	7	12	8	8	51	39	57%

*Category 1 - Number of subjects who both passed SCT criterion for this construction and also used construction appropriately in paraphrase interview, or who both failed SCT criterion for this construction and also failed to use construction appropriately in paraphrase interview.

**Category 2 - Number of subjects who passed SCT criterion for this construction but failed to use it appropriately in paraphrase interview, or who failed SCT criterion for this construction but used it appropriately in paraphrase interview.

of approximately fifteen minutes in length. Three versions of the SCT (differing only in order of items) were used, with subjects randomly assigned to one of the three versions. Interviews were taped and transcribed to facilitate accurate recording of subjects' responses to test items. Responses to test items were judged as appropriate if they met the set of criteria discussed above, as well as two additional criteria established after the field-testing:

1. The sentence completion is proceded by an accurate and complete repetition of the stem, or by a close paraphrase of the information in the stem; that is, a complete conjoined or embedded utterance, preserving the construction and including the connective term specified in the stem, is produced.

2. The sentence completion is semantically appropriate to the content of the item stem.

Application of the fifth criterion posed a problem. There were a number of sentence completions which were syntactically well-formed and which met each of the other criteria established for appropriate completion except that they were not semantically appropriate to the content of the item stem. Because it could be argued that these completions did demonstrate subjects' ability to produce conditional expressions using the specified construction, it was decided to tabulate the data two ways (both counting and not counting these completions as errors).

Treatment of the Data

Appropriate and inappropriate sentence completions were tabulated to determine which constructions were available to subjects for expressing conditionality. The criterion set as evidence that a construction was available to a subject for expressing conditionality was that the subject appropriately complete at least two of the three items of the SCT which involved that construction. Using this criterion, it was determined which of the ten constructions were "passed" and which were "failed" by each subject.

These data were analyzed to determine 1) whether increasing numbers of

constructions were available to subjects as they matured, and 2) whether an observable developmental order was present among the ten constructions. First, the numbers of subjects in each grade-level group who passed each construction were tabulated to determine whether increasing numbers of constructions were available to subjects as they matured. Secondly, several analyses were made to determine whether there was evidence of a developmental order among the ten constructions. These included:

1. Application of the Cochran Q test for k related samples, to determine whether the frequency-of-success rate was the same for each of the ten constructions within and across all grade-level groups.

2. Computation of the average age of subjects failing each construction, to provide a possible indication of developmental difficulty among the ten constructions.

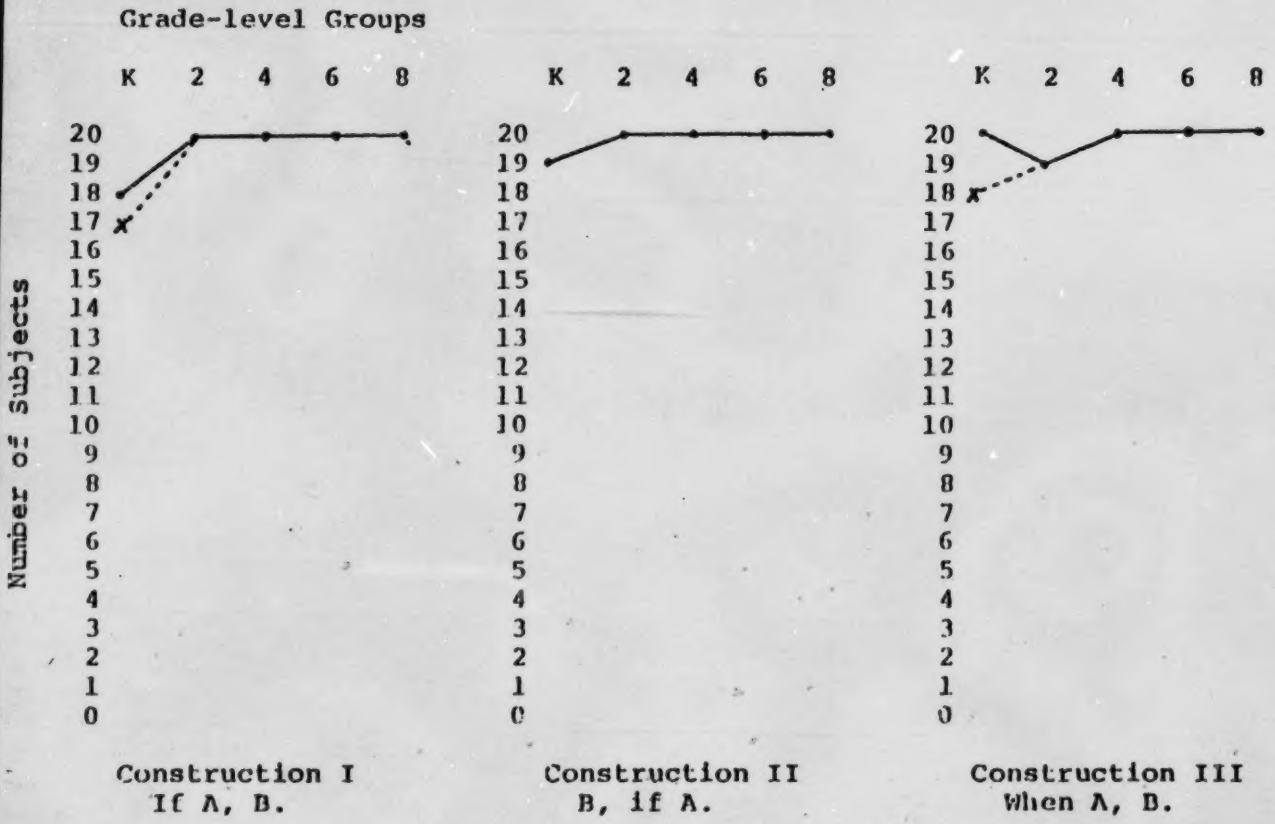
3. Computer analysis of test results employing the McNemar test for significance of difference between two related samples (or the binominal test, in cases where expected cell frequencies were less than five), to determine where there were significant differences in difficulty among the ten constructions.

Finally, a categorization of error types was made, based on the criteria for appropriate sentence completions described above.

Findings

Question One: Were increasing numbers of constructions available to subjects as they matured?

Tabulations were made of the numbers of subjects in each grade level group who passed each construction. As Figure I shows, the number of subjects passing each construction increased with age across all grade-level groups or remained the same across grade-level groups for every construction except III and VI.[8] For constructions III and VI, there were decreases at one grade level in the number of subjects passing those constructions, but in both cases the decreases were due to one subject at one grade level.


Grade-level Groups
K 2 4 6 8
Number of Subjects
20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Construction I
If A, B.
Construction II
B, if A.
Construction III
When A, B.

• when syntactically well-formed/semantically inappropriate responses were not counted as errors.

x when syntactically well-formed/semantically inappropriate responses were counted as errors.

Figure 1. NUMBER OF SUBJECTS AT EACH GRADE LEVEL PASSING EACH CONSTRUCTION

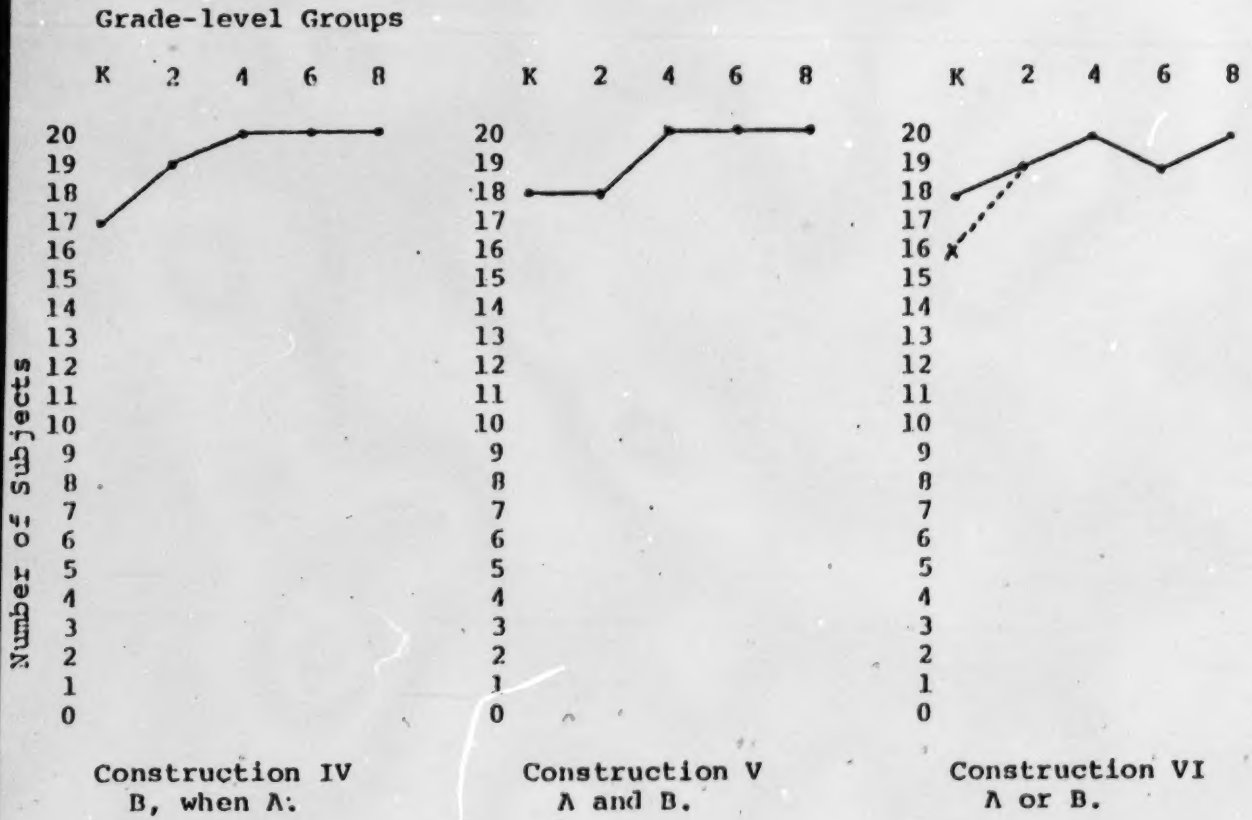

Grade-level Groups
K 2 4 6 8
Number of Subjects
20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Construction IV
B, when A.
Construction V
A and B.
Construction VI
A or B.

Figure 1 - continued

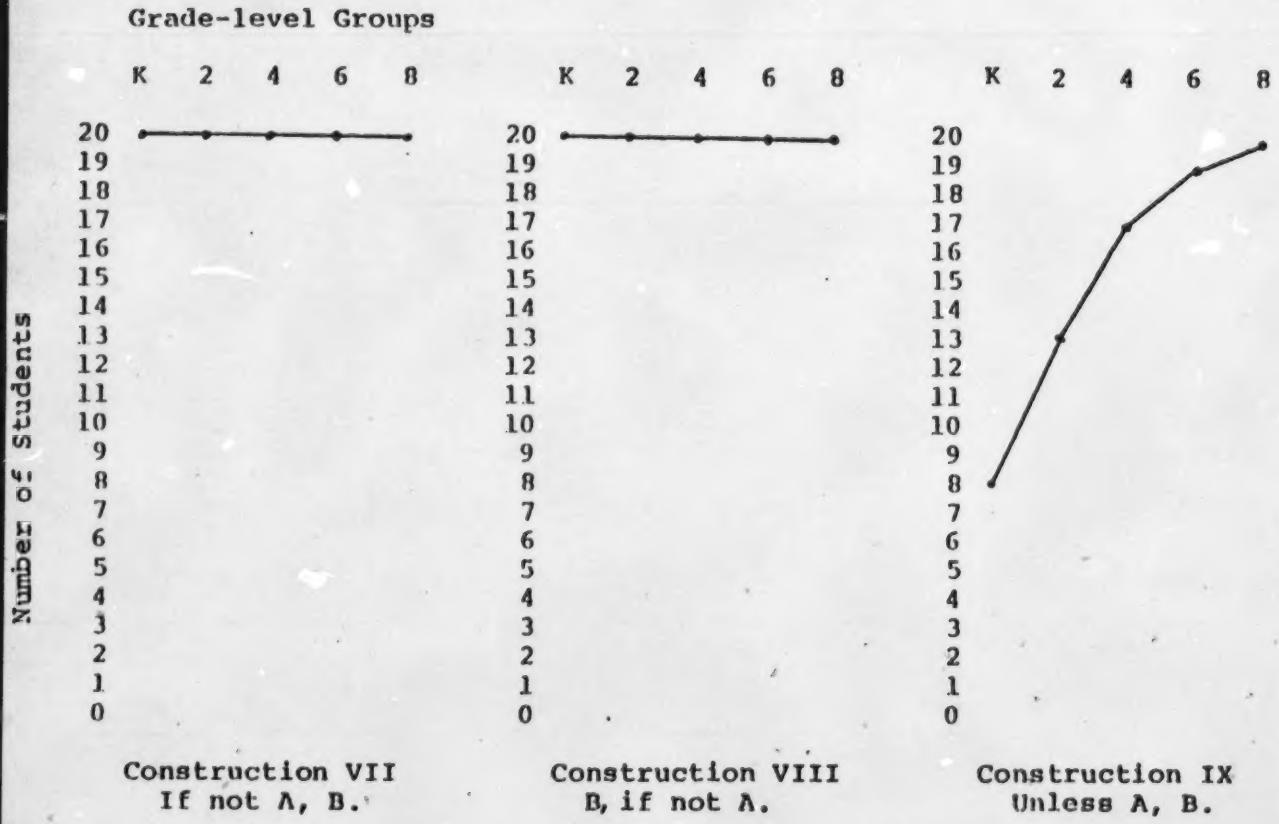
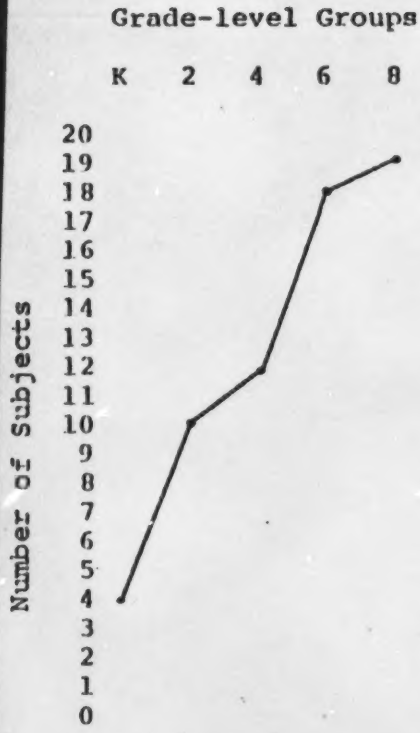

Grade-level Groups
K 2 4 6 8
Number of Students
20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Construction VII
If not A, B.
Construction VIII
B, if not A.
Construction IX
Unless A, B.

Figure 1 - continued



Construction X
B, unless A.

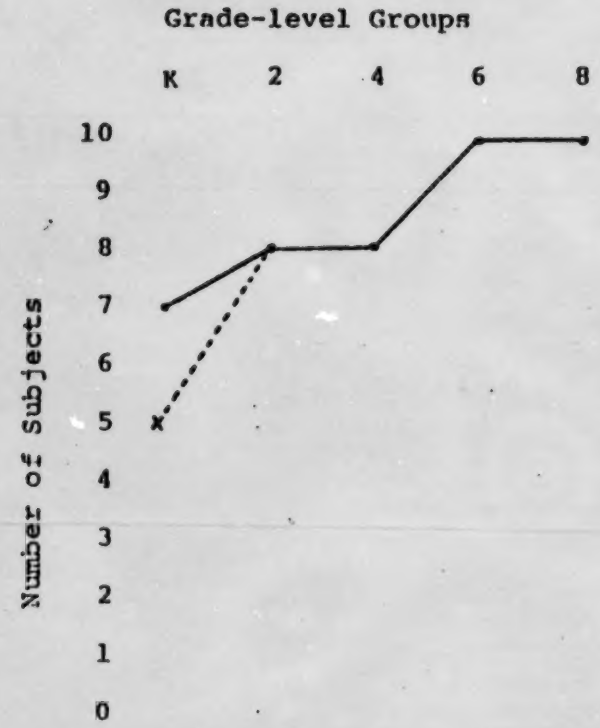
Figure 1 - continued

To address the question of whether there were increasing numbers of constructions available to subjects as they matured, tabulations were made of the number of constructions passed by 90% or more of the subjects within each grade-level group. As Figure 2 shows, the number of constructions passed by 90% or more of the subjects within each grade-level group increased across the grade levels studied, indicating that there were increasing numbers of constructions available to subjects as they matured.[9]

Question Two: Was there an observable developmental order among the ten constructions?

The Cochran Q test for k related samples (Seigel, 1956) was applied to the data to determine whether frequency-of-success rate was the same for each of the ten constructions within and across all grade-level groups. As Table 4 shows, the null hypothesis that frequency-of-success rate was the same for all constructions was rejected at the .01 alpha level for all 100 subjects and for subjects in kindergarten and in grades two and four. The null hypothesis was not rejected at the .01 alpha level for subjects in grades six and eight.

As Table 4 indicates, some constructions were found to be significantly more difficult than others for all 100 subjects and for subjects in kindergarten and grades two and four, but not for subjects in grades six and eight. While this difference in difficulty level among the ten constructions suggests the presence of a developmental order, it does not indicate what that order may be. Therefore, the average failure age associated with each construction was computed to provide a possible indication of developmental difficulty among the ten constructions.[10] The small numbers of failures observed for many of the ten constructions made impractical the application of statistical tests to determine whether there were significant differences among the average



. when syntactically well-formed/semantically inappropriate responses were not counted as errors.

x when syntactically well-formed/semantically inappropriate responses were counted as errors.

Figure 2. NUMBER OF CONSTRUCTIONS PASSED BY 90% OR MORE OF THE SUBJECTS AT EACH GRADE LEVEL

TABLE 4

COCHRAN Q TEST FOR SIGNIFICANCE OF DIFFERENCE IN FREQUENCY-OF-SUCCESS RATE AMONG THE TEN CONSTRUCTIONS ACROSS AND WITHIN GRADE LEVELS

	When Syntactically Well-formed/Semantically Inappropriate Completions Were Counted as Errors	When Syntactically Well-formed/Semantically Inappropriate Completions Were Not Counted as Errors
Total Group	$Q = 142.89$, $p < .001$*	$Q = 137.50$, $p < .001$*
K	$Q = 75.66$, $p < .001$*	$Q = 88.50$, $p < .001$*
2	$Q = 25.60$, $p < .01$*	+
4	$Q = 51.22$, $p < .001$*	+
6	$Q = 11.00$, $p < .20$	+
8	$Q = 9.00$, $p < .30$	+

* Significant at the .01 alpha level

+ No alternative error tabulations at this grade level; Q scores and probabilities same as Column 1

failure ages associated with the ten constructions. However, the ten constructions were arranged according to increasing failure age to indicate a presumptive developmental order, based on the assumption that more difficult constructions would more frequently be failed by older subjects than would less difficult constructions. Average failure ages associated with each construction are shown in Table 5. As Table 5 shows, when syntactically well-formed/semantically inappropriate responses were counted as errors, the order of developmental difficulty suggested by increases in average failure age was:

1. Construction VII - If not A, B.[11]
2. Construction VIII - B, if not A.[11]
3. Construction I - If A, then B.
4. Construction II - B, if A.
5. Construction IV - B, when A.
6. Construction III - When A, B.
7. Construction V - A and B.
8. Construction VI - A or B.
9. Construction IX - Unless A, B.
10. Construction X - B, unless A.

When syntactically well-formed/semantically inappropriate responses were not counted as errors, the order of developmental difficulty suggested by increases in average failure age was somewhat different:

1. Construction VII - If A, not B.[11]
2. Construction VIII - B, if not A.[11]
3. Construction I - If A, then B.
4. Construction II - B, if A.
5. Construction IV - B, when A.
6. Construction V - A and B.
7. Construction IX - Unless A, B.
8. Construction III - When A, B.
9. Construction VI - A or B.
10. Construction X - B, unless A.

As Table 5 shows, the ranking of Constructions III, V, VI, and IX was affected by the alternate error tabulations. It should be noted that there were small numbers of failures involved in most cases, making judgments of developmental order difficult. Nevertheless, the fact that there was a range of 65.00 months to 93.59 months in the average failure ages associated with the ten constructions suggests that there were differences in the levels of difficulty associated with the ten constructions.

TABLE 5

AVERAGE FAILURE AGE ASSOCIATED WITH EACH CONSTRUCTION

Constructions	When syntactically well-formed/ semantically inappropriate responses were counted as errors		When syntactically well-formed/ semantically inappropriate responses were not counted as errors	
	No. of Failures	Average Failure Age	No. of Failures	Average Failure Age
I	3	70.66 mos.	2	70.00 mos.
II	1	75.00 mos.	1	75.00 mos.
III	3	78.33 mos.	1	90.00 mos.
IV	4	77.00 mos.	4	77.00 mos.
V	4	82.00 mos.	4	82.00 mos.
VI	6	85.66 mos.	4	93.00 mos.
VII	0	65.00 mos.+	0	65.00 mos.+
VIII	0	65.00 mos.+	0	65.00 mos.+
IX	23	86.83 mos.	23	86.83 mos.
X	37	93.59 mos.	37	93.59 mos.

+Because Constructions VII and VIII were not failed by any subjects, average failure age for these constructions must be assumed to be less than 65 months, which was the age of the youngest subjects included in the sample.

In order to determine where there were significant differences in levels of difficulty among the ten constructions, McNemar tests (or binomial tests, where expected cell frequencies were less than five) were conducted on all possible pairs of constructions within and across all grade level groups. Computer analysis was used to establish two-by-two frequency tables and to test for significance of difference in changes, using the McNemar or binomial test (Nie and Hall, 1975). The null hypothesis tested was that there was no significant difference in the number of subjects who passed one construction but failed the second construction and the number of subjects who failed the first construction but passed the second. Chi squares and probabilities associated with each comparison, for all possible combinations of constructions within and across grade-level groups, are reported in Table 6.

As Table 6 shows, differences in difficulty significant at the .001 alpha level were found between constructions for all 100 subjects and for the twenty subjects in the kindergarten group.[12] For all 100 subjects, differences significant at the .001 alpha level were found between Construction IX and all other constructions except Construction X, and between Constructions X and all other constructions except Construction IX. There were no differences significant at the .001 alpha level between any other pairs of constructions for all 100 subjects. Differences significant at the .001 alpha level were found between Construction X and each of the other constructions except Constructions VI and IX for the twenty subjects in the kindergarten group. In addition, differences significant at the .001 alpha level were found between Construction IX and Constructions II, VII, and VIII for the kindergarten group. No other differences significant at the .001 alpha level were found between any other pairs of constructions for subjects in kindergarten, nor were there any differences significant at the .001

TABLE 6

MCNEMAR OR BINOMIAL TESTS FOR SIGNIFICANCE OF DIFFERENCE BETWEEN ALL POSSIBLE PAIRS OF CONSTRUCTIONS ACROSS AND WITHIN GRADE LEVEL GROUPS

Constructions Compared	Total Group		K		2		4		6		8	
	X^2	P	X^2	P	X^2	P	X^2	P	X^2	P	X^2	P
I and II		.3125		.3125		1.0000		1.0000		1.0000		1.0000
I and III		.6875		.5000		.5000		1.0000		1.0000		1.0000
I and IV		.5000		.6563		.5000		1.0000		1.0000		1.0000
I and V		.5000		.5000		.2500		1.0000		1.0000		1.0000
I and VI		.2266		.5000		.5000		1.0000		.5000		1.0000
I and VII		.1250		.1250		1.0000		1.0000		1.0000		1.0000
I and VIII		.1250		.1250		1.0000		1.0000		1.0000		1.0000
I and IX	16.4091	.0000*	5.8182	.0080		.0078		.1250		.5000		1.0000
I and X	30.2500	.0000*	9.6000	.0009*	8.1000	.0022		.0039		.2500		.5000
II and III		.3125		.5000		.5000		1.0000		1.0000		1.0000
II and IV		.1875		.3125		.5000		1.0000		1.0000		1.0000
II and V		.1875		.5000		.2500		1.0000		1.0000		1.0000
II and VI		.0625		.1875		.5000		1.0000		.5000		1.0000
II and VII		.5000		.5000		1.0000		1.0000		1.0000		1.0000
II and VIII		.5000		.5000		1.0000		1.0000		1.0000		1.0000
II and IX	20.0455	.0000*	9.0909	.0013*		.0078		.1250		.5000		1.0000
II and X	32.2368	.0000*	11.5294	.0004*	8.1000	.0022		.0039		.2500		.5000
III and IV		.5000		.5000		.7500		1.0000		1.0000		1.0000
III and V		.5000		.7500		.5000		1.0000		1.0000		1.0000
III and VI		.2266		.3125		.5000		1.0000		.5000		1.0000
III and VII		.1250		.2500		.5000		1.0000		1.0000		1.0000
III and VIII		.1250		.2500		.5000		1.0000		1.0000		1.0000
III and IX	15.0417	.0000*	6.7500	.0047		.0352		.1250		.5000		1.0000
III and X	28.6579	.0000*	10.5625	.0006*	5.8182	.0080		.0039		.2500		.5000
IV and V		.6563		.5000		.5000		1.0000		1.0000		1.0000

TABLE 6 - continued

Constructions Compared	Total Group		K		2		4		6		8	
	X^2	P	X^2	P	X^2	P	X^2	P	X^2	P	X^2	P
IV and VI		.3633		.5000		.7500		1.0000		.5000		1.0000
IV and VII		.0625		.1250		.5000		1.0000		1.0000		1.0000
IV and VIII		.0625		.1250		.5000		1.0000		1.0000		1.0000
IV and IX	15.4286	.0000*		.0020		.0352		.1250		.5000		1.0000
IV and X	29.2571	.0000*	11.0769	.0005*	5.8182	.0080		.0039		.2500		.5000
V and VI		.3438		.3125		.5000		1.0000		.5000		1.0000
V and VII		.0625		.2500		.2500		1.0000		1.0000		1.0000
V and VIII		.0625		.2500		.2500		1.0000		1.0000		1.0000
V and IX	14.0870	.0001*	6.7500	.0047		.0625		.1250		.5000		1.0000
V and X	31.0303	.0000*	12.0714	.0003*		.0039		.0039		.2500		.5000
VI and VII		.0157		.0625		.5000		1.0000		.5000		1.0000
VI and VIII		.0157		.0625		.5000		1.0000		.5000		1.0000
VI and IX	10.2400	.0007*	4.0833	.0217		.0352		.1250		.7500		1.0000
VI and X	25.7143	.0000*	8.6429	.0017		.0020		.0039		.5000		.5000
VII and VIII		1.0000		1.0000		1.0000		1.0000		1.0000		1.0000
VII and IX	21.0435	.0000*	10.0833	.0008*		.0078		.1250		.5000		1.0000
VII and X	35.0270	.0000*	14.0625	.0001*	8.1000	.0022		.0039		.2500		.5000
VIII and IX	21.0435	.0000*	10.0833	.0008*		.0078		.1250		.5000		1.0000
VIII and X	35.0270	.0000*	14.0625	.0001*	8.1000	.0022		.0039		.2500		.5000
IX and X	6.5000	.0054		.1094		.2266		.0899		.5000		.5000

*Significant at the .001 alpha level

alpha level between any pairs of constructions for subjects in grades two, four, six and eight. These findings were the same when syntactically well-formed/semantically inappropriate responses were counted as errors and when they were not.

Applications of the McNemar and binomial tests revealed differences significant at the .001 alpha level for all 100 subjects and for subjects in kindergarten. Constructions involving unless were found to be significantly more difficult than all other constructions for all 100 subjects. B, unless A was found to be significantly more difficult than constructions involving if, if + not, when, and and for kindergartners. Unless A, B was found to be significantly more difficult than constructions involving if + not for kindergartners. No differences significant at the .001 alpha level were found between any pairs of constructions for subjects at grades two and four, in spite of the fact that the presence of such differences was suggested by application of the Cochran Q test.

Error Analysis

An error analysis was done to determine if there were observable patterns in the types of errors made. All inappropriate completions of SCT items were categorized according to which of the criteria for appropriate completion were not met by the completions. There was a total of 336 errors made in 3000 sentence completions (thirty completions per subject, for 100 subjects). In Table 7, the numbers of errors occuring in each of the error categories are presented.

As Table 7 shows, nearly one-half of all errors involved inappropriate use of the connective term. Errors of this type included inappropriate pairing of connectives, as in(1) and (2) below, or the use of one

TABLE 7

NUMBERS OF ERRORS OCCURRING IN ERROR CATEGORIES

	Type of Error	Number of Errors of This Type	Percentage of Total Errors Which Were of This Type
1.	Repetition inaccurate or incomplete	79	24%
2.	Completion not clausal	11	3%
3.	Completion not conditional	10	3%
4.	Completion not syntactically well-formed, due to:		
	a. violation of pronoun restriction	33	10%
	b. violation of verb tense restriction	20	6%
	c. violation of connective restriction	138	41%
5.	Completion not semantically appropriate to stem, but syntactically well-formed	25	7%
6.	Other	20	6%
	Total	336	100%

connective as if it were another, as in (3) and (4) below. (Age of the speaker in years and months is given after each example.)

(1) We'll stop for ice cream unless if they have ice cream. (6;4)
(2) If you let me ride your skateboard and I'll let you play with my toys. (7;9)
(3) Unless the plants get enough light, they will grow straight and tall. (11;10)
(4) Joey goes to school every day unless he likes it. (5;9)

It should be noted that the vast majority of errors of this type (125 of the 138 errors in this category) occurred as subjects attempted to complete unless constructions.

About one-fourth of all errors involved inaccurate or incomplete repetition of item stems. Errors of this type included omission or substitution of connectives specified in item stems, as in (5) and (6) below, or incomplete or inaccurate repetition of item stems, as in (7) and (8) below.

(5) Don't lean out the window. You might fall out. (13;5)
(6) I'll give you a dog biscuit if you do a trick for me. (9;5)
(7) If the kitten sees...she will scratch him. (8;1)
(8) I'll trade if you give my peanut...if you give me my peanut butter sandwich. (7;9)

Close paraphrasing of item stems preserving both the information contained in the stems and the connective constructions specified, as in (9) below, were not counted as errors. It was felt by the investigator that occasional paraphrasings were to be expected when subjects were asked to repeat thirty consecutive stems.

(9) If you don't get your bike, it will get ran over. (5;10)

Ten percent of the errors were syntactically deviant sentence completions involving violations of pronoun restrictions. These included instances of indefinite pronoun reference as in (10) below, switching person as in (11) below, or lack of number agreement between pronoun and referent as in (12) below.

(10) If it sees the dog she will scratch it. (8;4)
(11) Your dog will be hungry if he doesn't feed him. (7;9)
(12) Unless the plants get enough light, it will die. (11;9)

Six percent of the errors were syntactically deviant due to violations of verb tense restrictions. If the appropriate tense was intended but inappropriately marked, as in (13) below, the sentence completion was not counted as an error. In cases where the wrong tense was used, as in (14), the completion was counted as an error.

(13) If you don't move your bike, it will be runned over. (7;9)
(14) We'll go to the circus today unless it started raining. (13;1)

Errors related to violation of syntactic restrictions (involving connective, pronoun, or verb tense violations) totalled 191 errors, or 57% of the errors made.

Sentence completions that were not clausal and completions that were not conditional each accounted for three percent of the errors made. Examples of errors of these types are given in (15) and (16) below.

(15) Give me your peanut butter sandwich, please. (6;0)
(16) Don't let me go or let me fall. (11;10)

Sentence completions that were syntactically well-formed but semantically inappropriate to the item stem made up seven percent of the errors. All analyses of the data were done including this set of responses as errors and again not including them as errors. These alternate analyses were done because the investigator did not feel that either including or excluding this set of responses was completely justifiable and consistent with other judgments of appropriateness or inappropriateness. While these completions were clearly not as satisfactory as completions semantically appropriate to item stems, it can be argued that any syntactically well-formed completion demonstrates the ability to use the construction specified. An example of a sentence completion of this type is given in (17) below.

(17) Mary gets mad when I do something bad to her. (8;0)

Failure to attempt sentence completions and a few other types of errors accounted for the remaining six percent of the errors observed.

In order to determine whether there were any patterns related to age observable in the types of errors made by subjects, the average age of subjects producing errors of each type was calculated. These averages are shown in Table 8. Error Types 2 and 6 had the lowest average ages, indicating that fewer older subjects made errors of these types. Error Types 3, 4a and 4b had the highest average ages, indicating that more older subjects made errors of these types.

Discussion

Based upon the findings of this study, it was concluded that children as young as five have within their linguistic repertoires the ability to use a variety of linguistic means for expressing conditionality. Like adults, children use connectives other than *if* to signal conditional relationships. The number of connective constructions for expressing conditionality available to children between the ages of five and thirteen increases as the children mature in age. Children as young as five use not only *if* but also connectives like *when*, *and*, and *or*, to express conditionality, in addition to other uses they may have for those constructions. Five-year-olds find *if + not* constructions no more difficult to use than *if* constructions, but find *unless* constructions more difficult than either of these. Some children through age thirteen continue to encounter difficulty in using *unless* constructions appropriately in some situations, often using *unless* as *if*.

The presence of a developmental order among the ten constructions was suggested both by the range of average failure ages associated with the

TABLE 8

AVERAGE AGE OF SUBJECTS PRODUCING EACH TYPE OF ERROR OBSERVED

	Type of Error	Number of Errors of this Type	Average Age of Subjects Producing Errors of this Type
1.	Repetition inaccurate or incomplete	79	8;1
2.	Completion not clausal	11	7;2
3.	Completion not conditional	10	8;8
4.	Completion not syntactically well-formed, due to:		
	a. violation of pronoun restriction	33	8;7
	b. violation of verb tense restriction	20	8;6
	c. violation of connective restriction	138	8;1
5.	Completion not semantically appropriate to item stem, but syntactically well-formed	25	7;8
6.	Other	20	7;1

constructions and by the significant differences found among frequency-of-success rates associated with the constructions across grade levels and within kindergarten, grade two, and grade four. When syntactically well-formed/semantically inappropriate responses were counted as errors, the following order of difficulty was indicated by average failure ages associated with each of the ten constructions:

1, 2. If not A, B; B, if not A
3. If A, B
4. B, if A
5. B, when A
6. When A, B
7. A and B
8. A or B
9. Unless A, B
10. B, unless A

When syntactically well-formed/semantically inappropriate responses were not counted as errors, the order of difficulty suggested by average failure ages was somewhat different:

1, 2. If not A, B; B, if not A
3. If A, B
4. B, if A
5. B, when A
6. A and B
7. Unless A, B
8. When A, B
9. A or B
10. B, unless A

However, when comparisons were made between all possible pairs of constructions to determine where there were significant differences in difficulty, only the unless constructions were found to be significantly more difficult than other constructions, for all 100 subjects and for kindergartners only.

The findings of this study included enough indications of developmental difficulty among the ten constructions to suggest that more significant differences between constructions at other grade levels might be found, given larger numbers of subjects within grade-level groups.

Replication of the study, including larger numbers of subjects within grade-level groups, might reveal significant differences between constructions at more age levels than in the present study, providing a more definitive answer to the question of whether an observable order is present in children's acquisition of these ten constructions for expressing conditionality.

Because the findings of the present study suggest that children as young as five already use some of the constructions studied to express conditionality, a study of younger children might provide more insight on the order in which such constructions are acquired. A study of this type would require different methodology than that of the present study, since it is doubtful that a sentence completion test of the length used in this study would yield reliable results with children much younger than five. Already-existing bodies of spontaneous speech data, if extensive enough to include a sufficient number of conditional statements, could be analyzed to provide data on the phrasing of conditional statements in children younger than five and to provide comparative data for children between the ages of five and thirteen. The Swedish study on spontaneous speech uses of and (Johansen and Sjolen, 1975), replicated among English-speaking children and extending the age range studied beyond 7;6, might reveal whether English-speaking children exhibit conditional as well as enumerative and temporal uses of and in spontaneous speech. Children's uses of when and or might be studied in the same way, providing the spontaneous speech corpus was extensive enough to include sufficient numbers of conditional utterances. (As Cazden, 1972, has noted, analysis of spontaneous speech as a means of assessing productive language may lead to under-estimation of children's linguistic competence, since not all

linguistic structures appear spontaneously in children's speech, even when they are within the linguistic capabilities of the children. Thus, while the presence of a particular connective used to signal conditionality would indicate its availability to the child, its absence might be due to factors other than its absence within the child's linguistic repertoire.)

Findings of the present study indicate that for children ages five to thirteen the logic underlying natural language expressions of conditionality is not that of formal logic. Children, like adults, use a variety of connective terms and constructions to signal conditional relationships in natural language. Based upon information about which constructions are available to children of various ages for expressing conditionality, research could be designed to explore whether children's phrasing of conditional utterances is affected by such factors as function or type of conditional utterance, age or status of the addressee, etc. A study exploring the pragmatics of how conditional expressions are phrased must be based on syntactic/semantic information about which constructions are available for expressing conditionality.

Other areas of investigation suggested by the present study include whether expressions of conditionality differ for speakers of dialects other than general American English, whether children also use instrumentals with by and for to indicate conditionality (as in "I'll give you $5 for mowing my lawn" or "You can get hurt by playing with matches"), and whether other linguistic or cognitive abilities are corrolated with the ability to use various phrasings for conditionality.

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FOOTNOTES

[1]For the purposes of this study, conditionality is defined as the logical relationship of implication (if P, then Q). That is, conditionality requires a contingency relationship between two events, such that the occurrence of the antecedent event entails the occurrence of the consequent (although the reverse is not true). In addition, the antecedent must be unknown or uncertain (in the case of indicative conditionals) or contrary-to-fact (in the case of subjunctives). Bi-conditionality is defined as the logical relationship of equivalence (if and only if P, then Q, which entails both if P, then Q and if Q, then P). Bi-conditionality requires both that the occurrence of the antecedent entails the occurrence of the consequent and the reverse, that the occurrence of the consequent entails the occurrence of the antecedent. As with conditionality, bi-conditionality requires the existence of a contingency relationship between two events, with the antecedent event unknown, uncertain, or contrary-to-fact.

[2]See Appendix A for a discussion of the selection of a data collection method.

[3]Judges included Dr. Ursula Bellugi,The Salk Institute, San Diego, California; Dr. Courtney Cazden, Harvard University; Dr. Carol Chomsky, Harvard University; Dr. Samuel Fillenbaum, The University of North Carolina, Chapel Hill; Dr. Paula Menyuk, Boston University; and Dr. Dan Slobin, The University of California, Berkeley.

[4]The Bonferroni inequality was used to control family Type 1 error over repeated tests (Miller, 1966). With the sum of the alphas equal to .05, each test was evaluated at the .001 level of significance.

[5]"Runaway Truck," I Wonder Card 2 from Peabody Language Development Kit, Level 2.

[6]It is possible that weakness in the design of the paraphrase task may have obscured evidence of a relationship between the two measures for Constructions II, IV, VIII, and X. These constructions, which require the consequent in first position, were perhaps not as readily apparent to subjects as possibilities for paraphrasing as were constructions beginning with the connective words displayed on the cards. It is possible that these constructions were not equally likely to be elicited by the task as it was designed, even if they were within subjects' linguistic capabilities.

[7]See Appendix B for the Sentence Completion Test.

[8]Two totals are reported for kindergartners for constructions I, III, and VI. This is because there was one set of responses for which tabulations were made both counting and not counting those responses as errors. In no case did these alternative error tabulations break the pattern of increases across grade levels in the numbers of subjects passing each construction.

[9]This was the case when syntactically well-formed/semantically inappropriate responses were counted as errors and when they were not.

[10]T. Clevenger, personal communication, March, 1979.

[11]Because no subjects failed Constructions VII and VIII, average failure ages for these constructions were assumed to be less than 65 months; therefore, their rank ordering cannot be determined.

[12]The Bonferroni inequality was used to control family Type I error over repeated tests (Miller, 1966). With the sum of the alphas equal to .05, each test was evaluated at the .001 alpha level.

APPENDIX A

SELECTION OF A DATA COLLECTION METHOD

Criteria Required for a Data Collection Method

The study of how children phrase conditional utterances required a data-gathering method meeting the following conditions:

1. The method must be usable with children as young as five.
2. The method must assess productive language rather than comprehension.
3. The method must be capable of eliciting production of all ten constructions under study.
4. The method must allow a determination of whether the semantic intent of the speaker is to express a conditional relationship.

These criteria were used to assess the suitability of a number of alternative data-collection methods for the study. Alternatives which were considered included analysis of spontaneous speech samples, cued speech, and several more structured test-like situations (including sentence repetition, paraphrasing, and sentence completion). These alternatives are discussed below.

Spontaneous Speech Samples

The analysis of spontaneous speech samples, while a common method of studying some aspects of children's language, is characterized by the problem that not all linguistic structures appear spontaneously in children's speech, even when they are within the linguistic repertoires of the children. Some structures, such as the passive, are rare even in speech of adults and may not be used in children's speech during periods of observation simply because they are not called for at those times. Thus, analysis of spontaneous speech as a means of assessing productive language may lead to under-estimation of

children's linguistic competence (Cazden, 1972).

Analysis of spontaneous speech as a method of studying children's phrasing of conditional utterances seemed particularly susceptible to this problem. First, it seemed unlikely that expressions of conditionality would be called for often enough in the normal speech situations in which children find themselves to make spontaneous speech an efficient or even a possible way of studying children's phrasing of conditionality. Secondly, where synonymous constructions (or paraphrases) are present within children's linguistic repertoires, spontaneous speech samples might not reveal the full range of paraphrases available to them, because the children felt no need to call upon a range of paraphrases, or because stylistic, contextual, or other factors determined that one or several phrasings were used while others were not. For these reasons, analysis of spontaneous speech samples was eliminated as a methodological possibility for the present study.

Cued Speech

Since the collection of spontaneous speech samples would not provide enough instances of conditional utterances nor a range of phrasings for these utterances, cued speech was explored as a way of increasing the incidence of conditional utterances. Field-testing was done to assess the use of story retelling and picture description as means of eliciting speech samples containing higher incidences of conditional utterances than spontaneous speech would contain.

Story Retelling. Slobin (1964) found story retelling a useful means of collecting speech samples including a range of syntactic structures. However, its usefulness for the purposes of this study was limited in that it allowed no way to tap the full range of possible phrasings for conditionality which might lie within children's capabilities; that is, children might have used

one or several phrasings for conditionality because of stylistic, contextual, or other factors without feeling a need to use other phrasings also within their linguistic capabilities.

Story retelling was field-tested to evaluate its suitability for the present study. Picture books in which the conditional relationship played a key role in the study were read to ten children ages five to nine. The books included ones in which the conditional relationship functions as the "hinge" of the plot (as in Rumplestiltskin by the Brothers Grimm and in The Practical Princess by Jay Williams), those which contain a number of conditional statements phrased with the if/then construction (If I Had by Mercer Meyer), and those employing a variety of phrasings for conditional statements (as in The Three Sillies by E. Zemach and in One Fine Day by Nonny Hogrogian). When the children were asked to retell each story after hearing it read, in most cases they used only the conditional phrasing used in the story (where one phrasing was used repeatedly), or they used only a few of the alternative phrasings used in the story (where a number of different phrasings were used in the story). In the latter case, the children most often used if/then and and constructions. Thus, it was decided that story retelling as a data-gathering method for the present study failed to meet the condition that the method must be capable of eliciting all ten of the constructions identified for study.

Picture Description. Cromer (1968) asked children to describe events illustrated in picture series as a way of eliciting a range of syntactic constructions (Cromer, 1968). The use of picture series to elicit conditional utterances was field-tested as a possible data-gathering method for the present study. Fourteen children ages five to thirteen were asked to talk about two

different types of pictures. First, each child was asked to discuss two pictures from the Peabody Language Development Kits ("Runaway Truck," I Wonder Card 2 from PDLK Level 2, and "Broken Window," Story Card 2 from PLDK Level 1). The format used to discuss each picture involved the interviewer asking the child to describe what had already happened in the picture, what kinds of things might happen next, and the circumstances under which things might happen (Taba, Durkin, Fraenkel, and McNaughton, 1969). Secondly, each child was shown five sets of pictures (Developmental Learning Materials' Reaction Cards No. 240) each portraying an antecedent event and three possible consequences. A modeling technique was employed, with the interviewer describing the first set of pictures using a variety of phrasings for conditional statements and then asking the child to "do the same thing" with the other four series of pictures (Lee, Koenigskecht, and Mulhern, 1975).

Neither the Taba interview nor the modeling technique elicited from the children a range of phrasings for conditional statements. The incidence of conditional statements was high in every interview, but the children used one or several phrasings for conditionality over and over. Thus, it was decided that picture description failed to meet the requirement that the data-gathering method must be capable of eliciting a range of phrasings for conditionality.

More Structured Test-like Situations

Since neither spontaneous speech nor cued speech met the criterion of being able to elicit a full range of phrasings for conditional utterances, more structured techniques were considered as possible data-gathering methods. These included sentence repetition, paraphrasing, and sentence completion.

Sentence Repetition. Sentence repetition is generally recognized as a fruitful method of studying the productive language capacity of children, especially when it is used with other analyses such as spontaneous speech

samples (Slobin and Welsh, 1974). In spite of this, it did not seem well-suited to the purposes of this study because it did not allow a determination of the semantic intent of the speaker. If, as Vygotsky (1962) suggested, children first use a particular construction to express some already-acquired relationship, then it is possible that a child might have repeated a conditional utterance involving and without assigning the utterance a conditional meaning, or that the child might have repeated an if/then or unless construction with some other logical relationship in mind. In other words, sentence repetition failed to meet the condition that the data-gathering method must allow a determination of the semantic intent of the speaker.

Paraphrasing. Because paraphrasing was used by Fillenbaum (1976) to study adults' phrasings for conditional utterances, it was considered a methodological possibility for the present study. However, the reliability of paraphrase data for assessing children's productive language capabilities has not been well-established. Smith (1974) found that children five to seven years old were unable to paraphrase structures which were apparently more difficult for them (including conjunction, extraction of subject, and extraposition). She also found that among the younger children studied, the ability to paraphrase was apparently related to content. Because it has not been well-established that paraphrasing meets the first condition required for the present study (that the method be usable with children as young as five), paraphrasing was not selected as the primary data-gathering method for the study. (It was later selected to elicit comparative data, as is discussed elsewhere.) Paraphrasing was field-tested with ten children ages five to thirteen. Each child was told four brief stories ending in conditional statements. It was found that all ten children were able to produce paraphrases, although the older children produced more paraphrases for each conditional than did younger

children. The older children also produced a wider range of phrasings for the conditional utterances, employing some phrasings not used by the younger children. There was, however, no way to know whether phrasings not employed by children were within their linguistic capabilities.

Sentence Completion. Sentence completion has been suggested by Bellugi (Slobin, 1967) as a means of studying the use of connectives in children's speech. Chomsky (1972) used sentence completion tasks to study children's use of although constructions.

The sentence completion tasks described by Bellugi and used by Chomsky consisted of a stem including one proposition and a connective term; subjects were asked to supply a second proposition. A modification of this format was necessary for the present study. Because several of the constructions to be studied (A and B; A or B; when A, B; and B, when A) may be used to express logical relationships other than conditionality, the semantic intent of conditionality cannot be conveyed in the stem alone. That is, a subject presented with the stem, "Give me your peanut butter sandwich and ..." might complete the stem with any of the following:

1. ". . . and your apple too."
2. ". . . and I want your cookies too."
3. ". . . and I'll be your friend."
4. ". . . and I'll give you my bologna sandwich."

Thus, context was needed for the stem to convey to subjects that it was a conditional utterance being elicited. For instance, the following context would give subjects a basis for determining that it was a conditional utterance being elicited:

> Scott and Chris are eating lunch at school. They have brought their lunches from home. Scott has a peanut butter sandwich, and Chris has a bologna sandwich. Chris would rather have Scott's sandwich, so she wants to trade with Scott. She tells Scott, "Give

me your peanut butter sandwich and . . ."

With this modification, sentence completion appeared to meet the four conditions required for a data-gathering method better than the other alternatives considered. Condition One, usability with children as young as five, was demonstrated through field-testing of both the original twenty-item Sentence Completion Test and the revised thirty-item Sentence Completion Test; no subjects of any age had difficulty producing sentence completions, and there were no items for which appropriate completions were not produced by subjects of every age tested. Condition Two, capability of the method to assess productive language rather than comprehension, was more difficult to demonstrate; this condition could be met with greater certainty if subjects could be required to produce both the connective and the second proposition. Since it was not possible to eliminate the connective from the stem and still convey both the semantic intent being elicited and the syntactic construction to be used, subjects were given both the first proposition and the connective and were required to repeat the stem before completing the sentence. Requiring repetition of the stem in addition to production of an appropriate sentence completion does not insure that a subject's ability to perform the task parallels his ability to independently produce that construction to express conditionality in spontaneous speech, but there is evidence that the ability to repeat a construction correlates with the use of that construction in spontaneous speech (Slobin and Welsh, 1964). Condition Three, capability of the method to elicit all ten constructions being studied, was met with sentence completion. Condition Four, determination of whether the semantic intent of the speaker is to express a conditional relationship, was also met with sentence completion, since the completion produced must exist in a conditional relationship with the proposition given for the completion to be judged as an

appropriate completion. Based on these considerations, sentence completion was selected for data collection in the present study.

APPENDIX B

A SENTENCE COMPLETION TEST FOR DETERMINING WHICH LINGUISTIC CONSTRUCTIONS ARE USED BY CHILDREN TO EXPRESS CONDITIONAL RELATIONSHIPS

Purpose of the Test: The test is designed to determine which of ten constructions children can use to express conditional relationships. The constructions to be tested, and the test items for each constructions, are listed below:

Construction	Test Items
I. If A, then . . . (B).	1, 4, 28
II. B, if . . . (A).	5, 7, 25
III. When A, . . . (B).	11. 13, 21
IV. B, when . . . (A).	2, 17, 19
V. A and . . . (B).	6, 14, 29
VI. A or . . . (B).	3, 16, 27
VII. If not A, then . . . (B).	12, 20, 26
VIII. B, if not . . . (A).	9, 15, 23
IX. Unless A, . . . (B).	10, 18, 22
X. B, unless . . . (A).	8, 24, 30

Testing Situation: Individual oral interview

Directions to the Subject: "I'm going to tell you some short stories. At the end of each story there's a sentence that isn't finished. I want you to finish that sentence for me in the way that you think is best. First I want you to repeat the unfinished sentence. Say it just the way I said it, and then finish the sentence in the way you think is best. For example, let's try this one:"

Example 1: Tom and Janie have made a kite. Janie wants to fly the kite right away. But there is no string on the kite. Tom says, "If we can find some string . . .

Example 2: (Use a second example item only if needed to clarify the task.)

Bobby wants to go on a picnic. He asks his mother. She says, "If it's a warm day tomorrow . . .

1. Jill is having a birthday party. She and her friends are playing games. The winner of each game gets a prize. If Bobby wins the next game . . .

2. Sally and Mary are best friends. Sometimes they get mad at each other. Sometimes Sally bosses Mary around. This makes Mary mad. Mary gets mad when . . .

3. Mark is learning to ride his new bike. Dad holds the bike up and Mark pedals. Mark is afraid Dad will let go. He doesn't think he can ride it by himself. Mark tells Dad, "Don't let go or . . .

4. Susie's new kitten is afraid of the dog. If the kitten sees the dog . . .

5. Janie's favorite show is on TV tonight. But Janie has homework to do. Dad tells Janie, "You can watch TV if . . .

6. Mike and his mother are going into the grocery store. Mike falls down and begins to cry. Mother knows that Mike is not really hurt. She says, "Stop crying and I'll . . .

7. Tommy wants to go to the movie. Dad thinks Tommy should pay for his own ticket. Dad tells Tommy, "You can go to the movie if . . .

8. Sherry and Sam have been shopping with Mom. On the way home, Mom says, "We'll stop for ice cream cones unless . . .

9. Joey has forgotten to feed his dog this morning. Mom says, "Your dog will be hungry if you don't . . .

10. Terry and his family want to go swimming on Saturday. But Mother is afraid that it will be too cold for swimming on Saturday. She says, "Unless it's too cold . . .

11. It is a rainy day. Bobby wants to play outside. Mom says, "When it stops raining . . .

12. Susie's bike is in the street. Dad thinks a car might hit it there. He tells Susie, "If you don't move your bike . . .

13. Joe and his family are eating supper. There is chocolate cake for dessert. Joe wants to eat his cake first. But Mother knows that Joe needs to finish his meal first. She tells Joe, "When you finish your meal . . .

14. Jeff is riding his bike. Billy is playing with his new skateboard. Jeff wants to try Billy's skateboard. He tells Billy, "Let me ride your skateboard and . . .

15. Tammy is playing on Dad's ladder. She climbs to the top of the ladder. Dad says, "You'll fall if you don't . . .

16. Pat is teasing Shawn. He grabs Shawn's new book. Shawn yells, "Give me that book or . . .

17. Kathy is teaching her dog Barky to do tricks. Kathy gives Barky a dog biscuit as a reward for doing tricks. Kathy tells Barky, "I'll give you a dog biscuit when . . .

18. Susie is almost late for school this morning. Mother says, "Unless you hurry . . .

19. Cheryl is saving her money to buy a new skateboard. She can buy the skateboard when . . .

20. Tom and Charles are at the swimming pool. Tom keeps splashing water in Charles' face. The lifeguard tells Tom to stop. He says, "If you don't stop splashing water . . .

21. Tracy's room is a mess. Toys are all over the floor. Dad wants Tracy to pick up her toys. Tracy wants to go outside to play. Dad tells Tracy, "When you pick up your toys . . .

22. Bill's class is growing plants at school. Their teacher tells them that the plants must have sunlight to grow. Unless the plants get enough light . . .

23. Frank is chasing his dog around the living room. He almost knocks over a lamp. Mother tells him to stop running in the house. She says, "You'll have to go to your room if you don't . . .

24. Dad has promised to take Marty to see the circus today. But there's a big raincloud in the sky, and it looks like rain. Dad tells Marty, "We'll go to the circus today unless . . .

25. Bob wants to make some money. Mr. Jones wants someone to walk his dog. Mr. Jones tells Bob, "I'll give you a quarter if . . .

26. Judy wants to watch a special TV show. Mother looks to see what time the show comes on. She says, "If it doesn't come on too late . . .

27. A parade is passing along the street in front of Jenny's house. Jenny leans way out the window to watch the clowns go by. Mother is afraid Jenny might fall out of the window. She tells Jenny, "Don't lean out the window or . . .

28. Mickey and Pat both want the last piece of candy in the box. They decide to have a race. The winner of the race will get the candy. If Pat wins the race . . .

29. Scott and Chris are eating lunch at school. They have brought their lunches from home. Scott has a peanut butter sandwich, and Chris has a bologna sandwich. Chris would rather have Scott's sandwich, so she wants to trade with Scott. She tells Scott, "Give me your peanut butter sandwich and . . .

30. Joey is in the third grade. He likes school. He goes to school everyday unless . . .